Mobile Manipulation for the Real World – A Case Study for Robotic Unloading

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• More than 15 years of international experience, with a strategy and marketing background in developed and emerging markets

• Currently responsible for developing and executing the company’s global growth strategy focused on organic growth through The Connected Distribution Center and other key breakthrough initiatives as well as inorganic growth through M&A and Venture Capital investments

• Before joining Honeywell Intelligrated, led strategy and marketing for Honeywell in Turkey and Central Asia

• Previous experience as a strategy consultant at Booz & Company and as director of strategic planning at Siemens

• MBA from the Ross School of Business at the University of Michigan and a bachelor's degree in environmental engineering from Tulane University
A Key Productivity Enabler, Primed for Extreme Growth

Robotics in the DC are vital to handle growing order volumes and overcome labor availability and resourcing challenges.

- E-commerce distribution volume is accelerating at a rate of 25% annually.
- Industry growth outpaces the labor pool by a ratio of 6:1.
- Manual operation is today’s norm for 80% of DCs.

Sources:
- eMarketer, internal analysis
- Datex Corp’s Labor Shortages in the Supply Chain Workforce presentation
- DHL’s Robotics in Logistics Study, St. Onge Company internal survey of customers
Labor By The Numbers

- Nearly 30% of the workforce is age 55 or older.
- Cost to rehire ranges from 25–150% of an employee’s annual salary.
- 600,000 warehouse jobs were unfulfilled in 2017.
- Repetitive motion injuries costs employers $80 million annually.

Annual turnover rate for warehouse workers is 36%.

Five injuries per 100 full-time warehouse workers — over 50% higher than overall average.

Source: U.S Bureau of Labor Statistics
Why Truck Unloading: The Three D’s

**Dull**
- Monotonous, repetitive, isolated work
- Difficult to sustain high level of productivity
- 30% annual turnover

**Dangerous**
- Lifting low/high, reaching, turning
- Crushed while unloading
- Struck by vehicles
- Falling off docks

**Dirty**
- Extreme temperatures
  - January: 12°F
  - July: 99°F air temp. → 140°F inside trailer
- Reduced efficiency
Mobile Manipulation For Robotic Truck Unloading

- Mobility enabled:
  - Trailers are well beyond the reach of a static arm
  - Allows the unit to unload entire trailer
  - Extends the reach with coordinated motion of the arm and conveyor
  - Navigation and sensing capabilities much like AMR but in confined space

- Manipulators (end of arm picking tool and extendable nose):
  - Designed to handle variable box positions and weights

Robotics Evolution

Technology advances enable robotics leap

- Vision systems
- Sensor technology
- Grasping technology
- Mobility
- Software
- Machine learning

Currently, robotics are employed in:

- **Completely Structured**
  - Little or no sensing
  - Highly repetitive tasks
  - Analogy: Trains on tracks

- **Partially Structured**
  - Aware of and adaptive to surroundings
  - Tasks follow pattern
  - Analogy: Cars on roads

- **Completely Unstructured**
  - Human equivalent degree of awareness and flexibility
  - Analogy: Cars off-road, free range

Logistics labor is mainly employed in completely unstructured and partially structured environments.
Technology Advances

Gripping Technology  Advanced Vision And Onboard Intelligence  Machine-Learning
Simulation
Cost Savings

Sample Labor Cost Savings

Labor costs: $45 / hr
(assuming $15 / hour x 3 employees per container)

Labor cost savings:
$112.50 – $180 per trailer

Annual savings:
Average of 15 trailers per day, 5 days / week:

$438,750 - $702,000
Considerations for Deploying Robots

1. Recognize that much of the data for these applications does not exist and will need to be collected/understood.
2. Pilot programs are critical to understanding the variability and determining the true value/ROI.
3. Try to limit the scope to keep projects as structured as possible. Constrain the variables/applications.
4. Understand what these solutions can/cannot do. It’s easy to overestimate the capabilities of robotic solutions (thanks, YouTube)
Selecting a Robotic Integrator

• Should have extensive knowledge of automation in the industry
• Deep understanding of robotics across the organization
• Has a plan and can execute it
  – Good pre-order service is an indicator of post-order service
  – Complete proposal with attention to detail
  – Installation and commissioning are two different skills. Do they have both?
  – Professional project management
• Reputation
  – What kind of references do they have? Are they offering to take you to installations?
  – Are they RIA-certified?
• Size matters
  – Can the company successfully execute more than one project at a time?
  – Financial security
• Remember, you are buying a solution, not just a robot
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